

WHAT IS CLAIMED IS

1. An echo canceller comprising an adaptive filter having filter coefficients adapted to cancel an echo in a near end signal, the echo comprising at least a portion of a far end telephony signal and at least a portion of a secondary audio signal.

2. The echo canceller of claim 1 wherein said adaptive filter comprises a finite impulse response filter.

3. The echo canceller of claim 1 wherein the finite impulse response filter comprises a linear transversal filter.

4. The echo canceller of claim 1 further comprising double talk logic to detect speech in the near end signal, said double talk logic controlling filter adaptation of the adaptive filter as a function of detection of speech in the near end signal.

5. The echo canceller of claim 1 wherein said secondary audio signal comprises a pulse metering tone.

6. The echo canceller of claim 1 further comprising a buffer, coupled to input of said adaptive filter, to combine said secondary audio signal and said primary telephony signal.

7. The echo canceller of claim 6 further comprising a decimator that downsamples the secondary audio signal to match a sample rate of the primary telephony signal.

8. The echo canceller of claim 6 wherein said adaptive filter generates an echo estimate of the combined secondary audio signal and the primary telephony signal, the cancellation of the echo in the near end signal being a function of the echo estimate.

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A 9. The echo canceller of claim 8 further comprising a
5 difference operator to subtract the echo estimate of said
combined secondary audio signal and said primary telephony signal
from the near end signal.

10 10. The echo canceller of claim 9 wherein output of said
difference operator is feedback to the adaptive filter as an error
signal for filter adaptation.

15 ~~11.~~ An echo canceller, comprising:
an adaptive filter having filter coefficients adapted to
cancel an echo in a near end signal, the echo comprising an
acoustic echo and an electrical echo.

20 12. The echo canceller of claim 11 wherein said acoustic
echo comprises at least a portion of a secondary audio signal
broadcast by a speaker and received by a near end microphone
coupled to said echo canceller.

25 13. The echo canceller of claim 12 wherein a set top box
generates said secondary audio signal.

30 14. The echo canceller of claim 12 wherein said electrical
echo comprises at least a portion of a far end telephony signal.

35 15. The echo canceller of claim 14 further comprising a
buffer, coupled to input of said adaptive filter, to combine said
secondary audio signal and said far end telephony signal.

16. The echo canceller of claim 15 further comprising a
decimator that downsamples said secondary audio signal to match
a sample rate of said far end telephony signal.

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5 17. The echo canceller of claim 15 wherein said adaptive filter generates an echo estimate of said combined secondary audio signal and said far end telephony signal, said echo canceller being a function of said echo estimate.

18. The echo canceller of claim 17 wherein said adaptive filter comprises a finite impulse response filter.

10 19. The echo canceller of claim 17 wherein the finite impulse response filter comprises a linear transversal filter.

15 20. The echo canceller of claim 17 further comprising a difference operator to subtract the echo estimate of said combined secondary audio signal and said far end telephony signal from the near end signal.

20 21. The echo canceller of claim 11 further comprising double talk logic to detect speech in the near end signal, wherein said double talk logic controls filter adaptation of the adaptive filter as a function of detection of speech in the near end signal.

25 22. A data transmission system, comprising:
a first telephony device that outputs a far end signal; and
a second telephony device coupled to the first telephony device, the second telephony comprising an adaptive filter having filter coefficients adapted to cancel an echo in a near end signal, the echo comprising an acoustic echo and an electrical
30 echo.

35 23. The data transmission system of claim 22 wherein said second telephony device comprises a speaker for broadcasting a secondary audio signal, said acoustic echo comprising at least

A 1 a portion of said broadcast secondary audio signal received by
a near end microphone of said second telephony device.

5 24. The data transmission system of claim 23 wherein said
second telephony device comprises a set top box, wherein said set
top box generates said secondary audio signal.

10 25. The data transmission system of claim 23 wherein said
electrical echo comprises at least a portion of a far end
telephony signal.

15 26. The data transmission system of claim 25 wherein said
secondary telephony device further comprises a decimator that
downsamples said secondary audio signal to match a sample rate
of said far end telephony signal.

20 27. The data transmission system of claim 25 wherein said
secondary telephony device further comprises a buffer, coupled
to input of said adaptive filter, for combining said secondary
audio signal and said far end telephony signal.

25 28. The data transmission system of claim 27 wherein said
adaptive filter generates an echo estimate of said combined
secondary audio signal and said far end telephony signal.

29. The data transmission system of claim 28 wherein said
adaptive filter comprises a finite impulse response filter.

30 30. The data transmission system of claim 28 wherein the
finite impulse response filter comprises a linear transversal
filter.

35 31. The data transmission system of claim 28 wherein said
second telephony device further comprises a difference operator

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A to subtract the echo estimate of said combined secondary audio
signal and said far end telephony signal from the near end
signal.

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32. The data transmission system of claim 22 wherein said
second telephony device further comprises double talk logic to
detect speech in the near end signal, wherein said double talk
logic controls filter adaptation of said adaptive filter as a
10 function of the detection of speech in the near end signal.

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33. A method of cancelling an echo in a near end signal,
said echo having a primary telephony component and a secondary
audio component, comprising:

combining a primary telephony signal and a secondary audio
signal to form a reference signal;

adaptively filtering the reference signal; and

subtracting the filtered reference signal from the near end
signal.

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34. The method of claim 33 further comprising re-sampling
said secondary audio signal to match a sample rate of said
primary telephony signal prior to combining said primary
telephony and secondary audio signal.

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35. The method of claim 33 further comprising detecting
speech in the near end signal and controlling filter adaptation
as a function of the detection of the near end speech.

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36. The method of claim 33 wherein the adaptive filtering
of the reference signal comprises generating an estimate of said
echo as a function of a transfer function of electrical and
acoustic echo paths.

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A 1 37. An echo canceller for cancelling an echo in a near end signal, said echo having a primary telephony component and a secondary audio component, comprising:

5 combining means for combining a primary telephony signal and a secondary audio signal to form a reference signal;

filtering means for adaptively filtering the reference signal; and

10 means for subtracting the filtered reference signal from the near end signal.

15 38. The canceller of claim 37 further comprising means for re-sampling said secondary audio signal to match a sample rate of said primary telephony signal prior to combining said primary telephony and secondary audio signal by the combining means.

20 39. The echo canceller of claim 37 further comprising means for detecting speech in the near end signal and means for controlling filter adaptation of the filtering means as a function of the detection of near end speech.

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